

ing districts of the Southwest, and more especially in Texas, the special warnings of freezing weather prompted measures of protection which resulted in averting large losses of produce.

The value of the warnings of freezing weather to the truck farmers is indicated by the following letter addressed to Dr. I. M. Cline, section director, Weather Bureau, Galveston, Tex., by Mr. B. F. Johnson, President Gulf Coast Horticultural Association:

I want to thank you, and through you, the Weather Bureau people for the promptness and accuracy of your warnings. We could not get along without them.

Four years ago you began giving us these warnings and since that time our truck farming has increased ten fold and will continue to grow under the fostering care of the Weather Bureau.

Your forecasts have been, in the main, correct to a degree, and I trust you will be permitted to continue the good work.

#### CHICAGO FORECAST DISTRICT.

Warnings were issued on the 4th for the cold wave which covered the eastern portion of the district on the 5th. No other cold wave of importance appeared until the 26th, the weather, as a rule, continuing comparatively mild in the meantime. In rapid succession three areas of high barometer with extreme cold moved across the district from the northwest, the first appearing the morning of the 26th, the second the morning of the 28th, and the third during the day of the 29th. Signals were ordered and warnings sent well in advance of the cold waves, except in the extreme Northwest, before the sudden development of the 28th.

The temperature forecasts have been closely watched by various interests, the movement of perishable goods being absolutely controlled by the forecasts during the winter months. The shipping interests which maintain winter service on Lake Michigan have been furnished information regarding winds whenever such information might be of value, and on the evening of the 25th a warning was issued that it would be dangerous to leave port, especially to vessels bound to or from points on the east shore of the lake.—*H. J. Cor, Forecast Official.*

#### SAN FRANCISCO FORECAST DISTRICT.

Prior to January 1 there had been a period of extreme drought which had prevailed in this State for twenty-one months. On December 31 a general rain warning was distributed throughout northern California, and on the morning of the 1st a similar warning was distributed in southern California. Rain forecasts were generally made for the next two weeks, when there was much rainfall in the State, an average of 3.50 inches, or more than one-half of an inch above the January normal, which has rendered it decidedly probable that good crops will be obtained from the northern half of the State and has prevented serious injury to stock and grain prospects in the southern part of the State.

On January 6 a southeast storm signal was hoisted at Eureka, and on the 9th at San Francisco and points north, while the information signal was displayed at Port Harford. These signals were continued on the 10th and storm signals ordered as far south as Ventura, and at 8 a. m. information signals were ordered at Los Angeles and San Diego. The information signals were changed to storm at 2:30 p. m. of the same date. Storm signals were continued from Ventura northward on the coast on January 11. During the period that these signals were displayed one of the most severe storms of which we have a record prevailed along the entire coast, verifying the storm signals at all points. Some damage

resulted, but undoubtedly the injury was greatly diminished owing to the display of the signals, for hardly a vessel attempted to leave any California port during the time the signals were displayed. In many instances regular liners remained in port; vessels that were out were in some instances a number of days overdue owing to the storm; the schooner *Jewel* was wrecked off the Mendocino coast; the river steamers between this point and Sacramento were forced to seek places of safety; the freight ferryboat *Thoroughfare* nearly capsized owing to the cars being thrown from the track; a large amount of injury was done to streets, sewers, etc. At the towns on the north side of the bay considerable injury resulted; several small houses were blown down and others were unroofed. Considerable damage was done to the sea wall at Sausalito; piling was washed out, railroad tracks flooded, etc.—*W. H. Hammon, Professor.*

#### PORTLAND, OREG., FORECAST DISTRICT.

Vessels remained in port during wind signals. During the gale of the 13-14th, on Puget Sound, the ship *Adelana*, at anchor at Tacoma, sunk. The disaster was due to the manner in which the ship was moored. She was held by a cable and ballast logs and the latter moved. She had discharged her freight and ballast and a slight change in position was sufficient to cause her to dip, fill with water, and sink.

The snow forecasts issued were of great benefit to railroad companies, farmers, and stock men.

The river warnings issued on the 21st were of special value to merchants on Front street. Many were preparing to move goods from cellars, but desisted when assured that there was no danger from flood.—*B. S. Pague, Forecast Official.*

#### AREAS OF HIGH AND LOW PRESSURE.

During the month there were ten highs and fourteen lows sufficiently well defined to be traced on Charts I and II. The accompanying table exhibits some of the principal points relating to the place of origin and disappearance, the duration and velocity of these conditions, and the following more particular description is added:

*Highs.*—Six of the highs were first noted to the north of Montana, and the other four in the middle Rocky Mountain plateau. The general path was toward the east and northeast. One was last seen in the west Gulf, five off the south Atlantic coast, and three near Newfoundland. No severe cold waves were experienced during the month. On the evening of 4th, as high No. II was central in the north Rocky Mountain region, a fall in temperature of 35° in twenty-four hours occurred at La Crosse, and of 32° at Dubuque and Keokuk. The next morning Keokuk and Davenport experienced a fall of 40°. On the morning of 7th, as high No. III approached the middle Gulf States, there was a fall of 40° at Atlanta, and of 38° at Montgomery. On morning of 26th, as high No. VIII moved to the north of Dakota, a fall in temperature of 54° occurred at Qu'Appelle, and of 50° at Williston. On the morning of 27th, as the same high moved to northeast Kansas, there was a fall of 46° at Parry Sound, and of 44° at Alpena.

*Lows.*—Of the storms of the month two were first noted off the north Pacific coast and two off the south Pacific. Four were first seen to the north of Montana and three near Manitoba, and the three remaining were first seen in Texas. The path of all the storms was east and northeast, and twelve of them disappeared over or near Newfoundland. No. IV was last seen in the middle Gulf, and XII disappeared off the middle Atlantic coast.

The highest winds of the month were reported as follows: On 7th, p. m., as low area No. II passed down the St. Lawrence Valley, Buffalo reported a wind of 72 miles an hour. On evening of 14th, as No. VI approached northeast, Buffalo again reported the highest wind of any station, 64 miles. On a. m. of 25th, as No. X passed into Nova Scotia, New York City experienced 64 miles. On p. m. of 26th, as No. XI passed down the St. Lawrence Valley, Buffalo reported 72 miles, and twenty-four hours later, when the storm reached the Gulf of St. Lawrence, New York City reported 64 miles. Finally, on evening of 28th, as low No. XII passed off the south Atlantic coast, it caused a wind of 60 miles an hour at Hatteras.—*H. A. Hazen, Professor.*

*Movements of centers of areas of high and low pressure.*

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
<b>High areas.</b>										
I.....	*29, a. m.	55	114	5, a. m.	22	79	Miles.	Days.	Miles.	Miles.
II.....	3, p. m.	47	113	6, p. m.	47	62	3,080	7.0	441	18.4
III.....	5, a. m.	47	116	8, p. m.	36	76	2,580	3.0	860	35.8
IV.....	8, a. m.	51	101	13, p. m.	46	63	2,850	4.0	712	29.7
V.....	13, p. m.	41	117	17, a. m.	48	55	1,900	5.5	346	14.4
VI.....	15, a. m.	51	109	21, a. m.	32	80	3,660	3.5	1,046	43.6
VII.....	20, p. m.	39	112	24, p. m.	46	56	2,460	6.0	410	17.1
VIII.....	24, a. m.	49	103	28, a. m.	34	75	3,450	4.0	870	36.2
IX.....	25, p. m.	52	108	28, a. m.	38	97	2,100	2.0	1,080	45.0
X.....	27, p. m.	54	108	30, p. m.	33	75	1,900	2.5	720	30.0
							2,700	3.0	900	37.5
Total.....							30,680	40.5	1,385	307.7
Mean of 10 paths.....							2,668		738	30.8
Mean of 40.5 days.....									659	27.5
<b>Low areas.</b>										
I.....	2, a. m.	47	126	5, p. m.	48	52	3,430	3.5	977	40.7
II.....	4, p. m.	28	101	7, p. m.	49	55	2,850	3.0	950	39.6
III.....	7, a. m.	54	112	9, a. m.	47	54	2,880	2.0	1,440	60.0
IV.....	7, p. m.	32	114	10, p. m.	30	89	1,560	3.0	520	21.7
V.....	9, p. m.	49	127	13, p. m.	50	94	1,530	4.0	382	15.9
VI.....	12, p. m.	32	99	15, p. m.	47	55	2,400	3.0	830	34.6
VII.....	15, a. m.	49	92	18, a. m.	48	56	1,740	3.0	580	24.2
VIII.....	19, p. m.	55	113	22, p. m.	49	53	2,790	3.0	930	38.8
IX.....	20, p. m.	53	116	24, p. m.	50	65	3,300	4.0	825	34.4
X.....	23, a. m.	33	96	25, p. m.	48	51	2,460	2.5	984	41.0
XI.....	23, p. m.	52	114	27, p. m.	50	54	2,850	4.0	712	29.7
XII.....	26, p. m.	37	99	28, p. m.	36	75	1,620	2.0	810	33.8
XIII.....	27, a. m.	52	98	29, p. m.	47	52	2,040	2.5	816	34.0
XIV.....	29, a. m.	34	115	† 1, p. m.	45	53	3,730	3.5	1,063	44.3
Total.....							35,250	43.0	11,819	492.7
Mean of 14 paths.....							2,518		844	35.2
Mean of 43.0 days.....									820	34.2

\* December. † February.

**RIVERS AND FLOODS.**

At the close of December, 1898, the Missouri River was frozen over to below Omaha, and continued so throughout the month of January, 1899. From St. Joseph, Mo., to the mouth of the Missouri the water fell steadily owing to the advance of the cold weather, and on the 31st, the river was practically closed as far as Hermann, Mo., 75 miles above the mouth.

The Mississippi was also frozen over as far south as Hannibal, and fell steadily in the open portion from below Hannibal to Cairo.

In the Ohio a rise began in the upper river on the 14th, reaching Cairo on the 19th, but no extremely high stages were reached, except at Evansville where the river was above the danger line from the 14th to the 23d, inclusive, reaching 39.1 feet on the 18th, or 4.1 feet above the danger line. Lowlands were submerged after the 12th, but aside from the temporary inconvenience to the farmers, no loss or damage resulted.

Previous to this rise, however, there had been another marked, though not prolonged, rise in the Ohio and its tribu-

taries on account of the substantial rains of the 4th, 5th, and 6th. In the Cumberland River stages from the danger lines to more than 8 feet above were general, but no reports of damage were received. In the Tennessee River at Johnsonville the water was from 1 to 3 feet above the danger line from the 10th to the 15th, inclusive. In the Emory River above Kingston, Tenn., a log boom broke on the 7th during a heavy rise in the mountain streams, and 1,000,000 feet of logs were swept away. At Chattanooga there was heavy drift from the 7th to the 10th, becoming lighter and ending on the 11th.

In the Mississippi River below Cairo the rise was steady after the 9th, cresting at Memphis on the 22d, and was still in progress at the close of the month from Vicksburg southward. A considerable volume of water also came out of the Yazoo River, which rose steadily after the 4th of the month.

The Ouachita at Camden, Ark., reached the danger line of 39 feet on the 18th, and fell rapidly thereafter. At Monroe, La., there was a steady rise after the 4th, but no high stages were reached.

A similar condition of affairs prevailed along the Red River.

The Atchafalaya rose steadily at the rate of about 0.5 foot per day from the beginning to the end of the month, reaching the danger line on the last day.

Low stages prevailed generally in the Susquehanna, except in the vicinity of Wilkesbarre. In the Wyoming Valley the rains from the 4th to the 7th caused the breaking of the ice gorge, and a rise of 15 feet in the river in four days, the water reaching a stage of 21 feet on the 7th, or 7 feet above the danger line, when the gorge broke. It remained above the danger line until the 20th. Many cellars in the lower end of the city were flooded, and some water came into the main portion. Interurban traffic was almost completely interrupted while the water was at its highest stage.

The James River at Richmond reached the flood stage on the 7th, and read 13.5 feet on the gauge on the 8th, or 1.5 foot above the danger line. This rise was due to the heavy rains of the 5th and 6th, and warnings were given as soon as reports from the upper river were received. A stage of 12 feet was forecast for 8 p. m. of the 7th, and the stage actually reached at that hour was 12.2 feet, a remarkably accurate forecast. Supplementary warnings were issued later of a 13-foot stage to arrive during the night. Some cellars were flooded, and there was some interruption of street car traffic. No damage to property was reported by transportation companies, all portable articles having been moved to places of safety after the warnings were received.

Nothing further of interest was noted in connection with river stages, except in Alabama, where, owing to heavy rains, the Black Warrior River at Tuscaloosa rose 44.6 feet in the three days from the 5th to the 8th, reaching a stage on the latter date of 49.3 feet, 11.3 feet above the danger line. Warnings of a 48-foot stage were issued at 8 a. m. of the 7th, another instance of remarkably accurate forecasting. At Demopolis there was also a rapid rise, the danger line of 35 feet having been reached on the 9th, and a crest of 47.6 feet on the 17th. No damage of consequence resulted from the rise.

Ice was present quite generally north and east of Cairo, and was sufficiently heavy at Cairo on the 1st of the month to impede ferryboat traffic. At Hannibal, Mo., the ice gorge above the Wabash bridge moved out on the 26th.

In the East ice was reported as far south as Lynchburg, where it was 1 inch thick on the 22d.

The rivers of central and eastern Pennsylvania were mostly frozen during the greater portion of the month, and ice 14 inches in thickness was reported at various places.

In the Hudson River 10-inch ice was harvested at Albany on the 4th. On the 6th the ice moved out and gorged south of the city, the river rising as a consequence to 7 inches above the top of the dock.